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ABSTRACT

The National Household Education Survey (NHES) is a data collection system of the National Center for Education Statistics, which has as its mission the collection and publication of data on the condition of education in the United States. The NHES is specifically designed to provide information on educational issues that are best addressed by contacting households rather than educational institutions. The NHES, which was conducted in 1991, 1993, 1995, and 1996, is a telephone survey of the noninstitutionalized civilian population of the United States. From 45,000 to 64,000 households are screened for each administration and those who meet predetermined criteria are sampled for more detailed or extended interviews. This report presents an overview of the NHES survey program from 1991 to 1996, addressing specific aspects such as survey topics, sample design, and data collection. It discusses how the NHES has evolved over time, but is not intended to provide detailed information about each NHES cycle. The following components were surveyed in these years: (1) 1991--early childhood education and adult education; (2) 1993--school readiness, school safety and discipline--parent and youth interviews; (3) 1995--early childhood program participation and adult education; and (4) 1996--household and library screening and parent/family involvement in education and civic involvement--parent interview. (Contains three tables.) (SLD)

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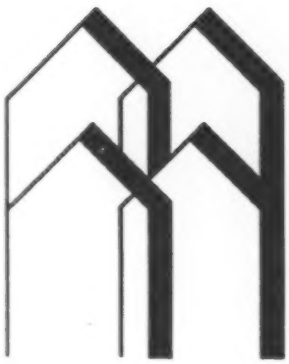
Technical Report May 1997

National Household Education Survey

An Overview of the National Household Education Survey: 1991, 1993, 1995, and 1996



National Household Education Survey

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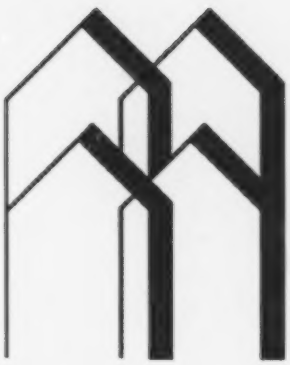

National Household Education Survey

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Table of Contents

Section	Page
Background	1
Survey Topics	2
NHES:91 Components	2
NHES:93 Components	4
NHES:95 Components	5
NHES:96 Components	5
Survey Design	6
General Design Features	6
Instrument Development	7
Sampling Procedures	10
Sampling Households	10
Oversampling Households for Blacks and Hispanics	11
Approaches to Household Enumeration	12
Sampling Within Households	13
Data Collection	16
Interviewer Training	16
Calling Protocol	16
Response Rates	18
Data Editing	20
Coding Open-Ended Items	20
Imputation	21
Weighting Procedures	21
Household Weights	22
Person Weights	23
Variance Estimation Methods	24

Table of Contents (continued)

Section	Page
Data Quality Assessment Activities	25
Reinterview Program	25
Coverage Bias	26
NHES Data Sets	26
NHES Publications	27
References	28

List of Tables

1.	Summary of NHES interviews	3
2.	Mean administration time for Screeners and extended interviews, by survey year	8
3.	Weighted NHES completion and response rates, by survey year and component	19

Background

The National Household Education Survey (NHES) is a data collection system of the National Center for Education Statistics (NCES), which has as its legislative mission the collection and publication of data on the condition of education in the Nation. The NHES is specifically designed to support this mission by providing information on those educational issues that are best addressed by contacting households rather than schools or other educational institutions. The NHES, which was conducted in 1991, 1993, 1995, and 1996, provides descriptive data on the educational activities of the U.S. population and offers policymakers, researchers, and educators a variety of statistics on the condition of education in the United States.

The NHES is a telephone survey of the noninstitutionalized civilian population of the United States. Households are selected for the survey using random-digit-dialing (RDD) methods, and data are collected using computer-assisted telephone interviewing (CATI) procedures. From 45,000 to 64,000 households are screened for each administration, and individuals within households who meet predetermined criteria are sampled for more detailed or extended interviews. The data are weighted to permit estimates of the entire population. The NHES survey for a given year typically consists of a set of screening questions (Screener), which collects household composition and demographic data, and extended interviews on two substantive components addressing education-related topics. In order to assess data item reliability and inform future NHES surveys, each administration also includes data quality studies such as reinterviews with a subsample of respondents.

Throughout its history, the NHES has collected data in ways that permit estimates to be tracked across time. This includes repeating topical components on a rotating basis in order to provide comparative data across survey years. In addition, each administration of the NHES has benefited from experiences with previous cycles, resulting in improvements to the survey procedures and content. Thus, while the survey affords the opportunity for tracking phenomena across time, it is also dynamic in addressing new issues and including conceptual and methodological refinements.

A new design feature implemented in the NHES:96 was the collection of demographic and educational information on members of all screened households, rather than just those households potentially eligible for a topical component. This expanded screening feature included a brief set of questions on an issue of interest to education program administrators or policymakers. In the NHES:96, these questions were about public library use. The total Screener sample size was large enough to produce state estimates of household characteristics and public library use for the NHES:96.

The NHES system has also included a number of methodological investigations that have resulted in technical reports and working papers covering diverse topics such as telephone undercoverage bias, proxy reporting, sampling methods, and household screening approaches. This series of technical reports and working papers provides valuable information on ways of using the data from the surveys and improving the NHES in the future.

This report presents an overview of the NHES survey program from 1991 to 1996. It addresses specific aspects of the NHES (e.g., survey topics, sample design, and data collection) and discusses how the NHES program has evolved over time. This report is not intended to provide detailed information about each NHES cycle; readers who are interested in additional detail on specific survey administrations or survey components are encouraged to obtain and review the Data File User's Manuals for the components of interest that come with the public use files, other technical and substantive reports, and project working papers.

Survey Topics

The NHES program began with a field test that included two topical components, dropping out of school for 14- to 21-year-olds and early childhood education for 3- to 5-year olds. While this 1989 field test was large in scale, involving the screening of 15,000 households, its purpose was not to provide research data bases but to test the NHES design and to evaluate the two survey topics as candidates for the NHES design. The dropout component has not been repeated, but the success of the early childhood component led to the inclusion of a component focusing on young children in each NHES collection.

Each NHES administration has included two substantive components related to aspects of education that can effectively be studied by interviewing members of households. The two topics addressed by the NHES:91 were early childhood education and the educational activities of adults. The NHES:93 collected information about children's readiness for school and the safety and discipline in school reported by parents and students. The 1991 components were repeated for the NHES:95, but underwent substantial redesign to incorporate new issues and develop new measurement approaches. In the NHES:96, the topical components focused on parent and family involvement in the education of children and the civic involvement of both adults and youth. The NHES:96 expanded screening feature also included a set of questions on public library use.

Table 1 shows the topics and the number of completed interviews for each survey year. In the sections that follow, the content of each survey component and the populations of interest are discussed in more detail. As noted in the discussion below, most topics addressed in the NHES during the period from 1991 through 1996 were related to one or more of the National Education Goals for the year 2000. However, each NHES administration also collected information about adults, children, or households that went beyond the specific measures mentioned in or implied by the National Education Goals and their objectives, and the NHES has the capability to address additional survey topics as well.

NHES:91 Components

The NHES:91 Early Childhood Education (ECE) component concerned the care and educational experiences of 3- to 8-year-old children. Children age 9 who had not yet completed second grade were also included in order to examine retention in early grades. The early childhood experiences of children have a strong influence on their later academic achievement and persistence, but limited national information was available on these experiences. The NHES:91 ECE component provided nationally representative data to help fill this gap. In addition, the survey provided data to help track progress toward meeting the National Education Goals, one of which is that "By the year 2000, all children in America will start school ready to learn."

Table 1.— Summary of NHES interviews

Survey year and component	Number of completed interviews
NHES:91	
Early Childhood Education	13,892
Adult Education	12,568
NHES:93	
School Readiness	10,888
School Safety & Discipline -- Parent interview	12,680
School Safety & Discipline -- Youth interview	6,504
NHES:95	
Early Childhood Program Participation	14,064
Adult Education	19,722
NHES:96	
Expanded Screener/Household & Library	55,838*
Parent/Family Involvement in Education and Civic Involvement -- Parent interview	20,792
Youth Civic Involvement	8,044
Adult Civic Involvement	2,250

*Of the 55,838 households with which Screeners were completed, 130 households were found to include only persons on active duty in the armed forces. As a result, these households were eliminated from the pool of completed Screeners, and 55,708 were retained.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Survey (NHES).

The ECE component of the NHES:91 was designed to collect information on children's experiences in various types of nonparental child care arrangements and early childhood programs. For preprimary school children (those who had not yet enrolled in 1st grade), information was collected on children's participation and experiences in four types of nonparental care and programs: care by relatives (not including parents); care by nonrelatives; daycare centers; and center-based programs such as nursery schools, prekindergartens, and Head Start. For primary school children who were currently enrolled in 1st, 2nd, or 3rd grade, information was collected about children's kindergarten and primary school experiences, including age at entry and any repeating of grades. In addition, a wide range of home and family activities was covered in the survey, including reading, singing, arts and crafts, visiting zoos and museums, and attending live shows. This broad approach permits analysis of the variety and types of experiences of children that may be important determinants of early school success. Parents or

guardians of sampled children who were most knowledgeable about the child's care and education responded to these interviews.

The second component of the NHES:91 was designed to measure participation in adult education activities, describe these activities, provide data on the characteristics of participants and nonparticipants, and explore why some adults participate while others do not. One of the National Education Goals is that "By the year 2000, every adult American will be literate and possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship." The Adult Education (AE) component provided a wealth of information relative to this goal.

The AE component of the NHES:91 incorporated and expanded upon the kinds of data that were collected in previous surveys on adult education designed by NCES and conducted by the Bureau of the Census (Hill 1987). An inclusive definition of adult education was used to encompass persons enrolled full-time or part-time in a college or vocational or occupational program, those taking continuing education or noncredit courses, correspondence courses, and tutoring, as well as those taking courses or participating in other educational activities provided by employers, community groups, and other providers. Interviews were conducted with participants and with nonparticipants in educational activities. The population of interest included civilian adults age 16 and older who were not enrolled in elementary or secondary school at the time of the interview.

NHES:93 Components

The NHES:93 addressed children's readiness for school and safety and discipline in school, topics related to two of the National Education Goals. One goal states that "By the year 2000, all children in America will start school ready to learn." Another goal states that "By the year 2000, every school in America will be free of drugs and violence and will offer a disciplined environment conducive to learning."[1]

The NHES:93 School Readiness (SR) component examined several issues relevant to readiness for school for children age 3 through 7 and children age 8 or 9 who were still in second grade or below (children over age 9 who were in 2nd grade or below were ineligible). The SR component addressed experience in early childhood programs, the child's accomplishments and difficulties in several developmental domains, school adjustment and related problems, delayed kindergarten entry, and early primary school experiences including repeating grades, the child's general health and nutritional status, home activities, and family characteristics such as stability and economic risk factors. This approach, which encompasses a variety of characteristics important to school readiness, is referred to as a "whole child" approach. Again, parents or guardians of sampled children who were most knowledgeable about the child's care and education responded to these interviews.

The second component of the NHES:93, School Safety and Discipline (SS&D), focused on four areas: school environment, school safety, school discipline policy, and alcohol/other drug availability and education. Parents or guardians of children in 3rd through 12th grades were interviewed, as were youth in 6th through 12th grades.

In the SS&D interview, parents and students provided their general perceptions of the school learning environment. Specifically, respondents were asked about academic challenge, classroom and school discipline, and student norms for hard work and good behavior. Respondents also

[1] Since the NHES:93 School Safety and Discipline component was designed and conducted, the relevant National Education goal has become, "By the year 2000, every school in the United States will be free of drugs, violence, and the unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning."

evaluated the safety of their schools regardless of whether they (or their child, in the case of parent interviews) had been personally victimized. The component incorporated measures of "secondary victimization," such as knowledge of and witnessing occurrences that can adversely affect the learning environment even if the student has not been victimized directly. Parent and youth perceptions of school discipline policy were also measured. Exposure to alcohol and other drugs at school was gauged, as were parent and youth knowledge of alcohol/drug education programs. Other items about parental expectations for academic achievement and for their children's tobacco and alcohol use, parental efforts to educate and protect children regarding safety and substance use, parental involvement in the child's school, and the safety of the school relative to the child's neighborhood were also included.

NHES:95 Components

The NHES:95 addressed participation in nonparental child care and early childhood programs and participation in adult education. While the NHES:95 components repeated those included in the NHES:91, several changes were made to the sample design and instruments based on experience with the earlier survey.

The NHES:95 Early Childhood Program Participation (ECPP) component focused on children's early experiences in various types of nonparental child care arrangements and early childhood programs. The core of this survey collected extensive information on children's participation and experiences in four types of nonparental care and programs: care by relatives (not including parents); care by nonrelatives; Head Start programs; and other center-based programs such as day care centers, preschools, and nursery schools. Other information collected in this component pertained to children's kindergarten and primary school experiences; literacy-related home activities; children's health and disability status; and child, family, and household characteristics. The population of interest for the ECPP component was expanded from the NHES:91 population to include children from birth to 3rd grade, up to age 10; the most knowledgeable parent or guardian of the sampled child responded to the interview.

The NHES:95 Adult Education (AE) component focused on the participation of adults in a wide range of educational activities during the 12 months prior to the interview. The development of the NHES:95 AE component benefited from experience with the NHES:91, which led to several refinements including less variation in the sample design and direct questions about specific types of AE activities to prompt recall. The population for this survey was persons age 16 and older who were not enrolled in elementary or secondary school and not on active duty in the U.S. Armed Forces at the time of the interview. The sampled adults were asked about their participation in seven broadly defined types of adult education activities: adult basic skills and General Educational Development (GED) preparation classes, English as a second language instruction, courses taken toward college degrees or vocational diplomas or certificates, apprenticeship programs, career- or job-related courses, any other formally structured courses, and computer-only or video-only instruction on the job. The AE component also collected data pertaining to reasons for and barriers to participation in adult education.

NHES:96 Components

The NHES:96 included parent and youth interviews focusing on Parent and Family Involvement in Education (PFI) and Civic Involvement (CI). The population of interest for the PFI component included children from age 3 through 12th grade. The population of interest for the CI component included children in 6th through 12th grade and their parents and civilian adults age 18 and older. As noted earlier, households were also asked about public library use in the expanded household screening interview in this survey.

In the PFI component, information was collected on children's schools or center-based early childhood programs. In addition, information was collected on family involvement, including the involvement of the nonresidential parent, in four areas: children's schooling, communication with teachers or other school personnel, children's homework and behavior, and activities with children outside of school. Other items captured parents' involvement in home schooling. The majority of these questions were asked only of the most knowledgeable parents; however, some questions were asked of parents and youth and others only of youth. The component also collected information about parents' and youths' reports of the school environment, and parents' reports of school practices to involve and support families, and barriers to family involvement.

The CI component of the NHES:96 provided an assessment of the opportunities that youth in grades 6 to 12 have to develop the personal responsibility and skills that would facilitate their taking an active role in civic life. It gathered information from both youth and their parents related to the diverse ways that parents may participate in socializing their children for informed civic participation, for example, by discussing national issues or participating in community service. The CI component included measures of attitudes and knowledge related to civic life. This survey component also gathered information from youth about school practices that would prepare them to be involved in community and civic life.

In order to provide national estimates for all adults, not just parents of students in 6th through 12th grade, the CI component included a sample of civilian adults age 18 and older, excluding those still in high school. The adult were asked about sources of information on politics and national issues, organizational participation, civic participation, political attitudes, and knowledge of government.

Finally, the new feature of expanding the questions asked in the household screening interview was fully implemented in the NHES:96. Called the Expanded Screener component, it provided monitoring information on the educational and demographic characteristics of all persons, regardless of whether anyone in the household was eligible for sampling for a topical component. It included information on the enrollment status, grade, and educational attainment of each household member, as well as demographic characteristics such as age, gender, marital status, country of birth, and first language spoken. In addition, the Expanded Screener included a brief set of substantive questions that address a topical area of concern to the Department of Education. In the NHES:96, the topical component in the Expanded Screener was household use of public libraries. The NHES:96 provided state as well as national estimates for household characteristics and for items on household public library use.

Survey Design

This section addresses the design of the NHES. The first subsection focuses on general design features of the survey system. The second subsection discusses some specific aspects of the survey instrument development process used in the NHES and how these design activities have changed over time. Finally, changes over time in the screening of households in the NHES, a key design feature, are described.

General Design Features

The NHES was developed to provide reliable estimates for each of two different topical components addressed in the survey for a given year. In the NHES:96, the Expanded Screener provided a new monitoring capability. The inclusion of two topical components makes the overall survey more cost effective, thus allowing for larger sample sizes that lead to more precise estimates. This strategy has been key to the NHES design. By including more than one topic within the framework of a single survey,

screening of households to find those eligible for the study could be partitioned over the component surveys.

Another general feature of the NHES design was developed in response to concerns about the demands placed upon the respondents to surveys. With the introduction of multiple survey components within a single framework came the possibility of increasing the number of interviews and the response burden on the members of the sampled households. It was possible that the same household member could be asked to respond to more than one interview or that more than one household member could be sampled. To help alleviate this response burden and to improve the response rate for the component surveys, differential sampling within households was used. The objective was to reduce the number of interviews within a household and still obtain the required information in a cost-effective manner.

Even though sampling methods were used to reduce the chances of selecting the same household for multiple interviews, the administration time of the interview was a critical factor in obtaining high response rates and reliable estimates. The number of items included and length of the interview were limited in order to help improve response rates and reduce the demands made on survey respondents. In the NHES:91, the interviews were designed to take no more than 15 minutes, on average. In subsequent years, the interviews were designed to have average times of 20 minutes or less. Table 2 show the average administration time for the Screeners and extended interviews by survey year.

Because of the complexity of the NHES design and the need to produce estimates of high quality in a timely manner, the NHES has been conducted using computer-assisted telephone interviewing (CATI) technology. Some of the advantages of CATI for the NHES include improved project administration, online sampling and eligibility checks, scheduling of interviews according to a priority scheme to improve response rates, and managing data quality by controlling skip patterns and checking items for allowable ranges and logical consistency during the interview.

Instrument Development

Over time, resources devoted to the development of topical components for the NHES collections changed. Initially, the NHES had a relatively brief development period. In the NHES:91, development of the survey began about 1 year prior to the start of data collection; in the NHES:93, work on the survey began about 10 months prior to data collection. The development period for the NHES collections was expanded beginning with the NHES:95. The purpose of this expanded development period was to accommodate additional background research prior to instrument development and additional testing of the instruments. Below, these design activities and how they have changed over the course of the NHES program are described.

Table 2.—Mean administration time for Screeners* and extended interviews, by survey year and component

Survey year and component	Number of interviews*	Mean interview length in minutes
NHES:91		
Screener	60,314	3.2
Early Childhood Education	13,892	12.2
Adult Education	12,568	14.0
NHES:93		
Screener	63,844	2.5
School Readiness	10,888	21.5
School Safety and Discipline-Parent	12,680	18.3
School Safety and Discipline-Youth	6,504	12.0
NHES:95		
Basic Screener	43,987	3.2
Early Childhood Program Participation	14,064	12.6
Adult Education	19,722	13.9
Adult Education, Splice	3,569	4.1
NHES:96		
Expanded Screener/Household & Library	55,838	7.1
Parent/Family Involvement in Education and Civic Involvement	20,792	18.7
Youth Civic Involvement	8,044	10.4
Adult Civic Involvement	2,250	9.6

*Number of completed Screeners is the number for which timing data were available.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Survey (NHES).

Review of extant research. Beginning with the NHES:95, extensive reviews of extant data sources were conducted to support the development of the survey components. The intent of these reviews was twofold. First, this activity was designed to set a context within which the NHES would operate, that is, to present information on surveys that address similar issues. Second, the reviews examined the limitations of other surveys and explored how they could be ameliorated in the NHES.

Consultation with experts. Consultation with a Technical Review Panel (TRP) comprising persons with relevant substantive and methodological expertise had always been a feature of the NHES system. The NHES:95 and NHES:96 also included greater levels of consultation with experts in relevant fields prior to the start of instrument development. These consultations took place in two forms. First, survey managers and NCES personnel consulted individually with experts in the fields of interest

in order to obtain feedback on key issues associated with the topical components. Second, a group meeting of experts in the relevant fields was held for each topical component for the purpose of refining the issues that were identified initially and developing the research questions of highest priority to those in the field. A TRP for each survey component was convened to review the instrument content and design.

Cognitive laboratory research. The use of cognitive laboratory research, both focus groups and individual interviews, began with the NHES:91 ECE component. More extensive cognitive laboratory research was conducted in the NHES:93 but was limited by the brief time frame available for the design of that survey. In the NHES:95 and NHES:96, extensive, multi-cycle cognitive laboratory research was conducted in order to develop and test the survey instruments. Cognitive laboratory activities in the NHES have included individual interviews, using concurrent and post-interview debriefing methods, and focus groups following telephone administration of the interviews. Further information on cognitive laboratory applications in the NHES is provided in *Use of Cognitive Laboratories and Recorded Interviews in the National Household Education Survey* (Nolin and Chandler 1996).

Field tests. Another aspect of instrument development that has evolved since the first NHES is the use of field tests that address the methodological issues associated with collecting and analyzing data on the topical components. In the field test, the number of households sampled was smaller than would be included in a full-scale survey and the callback protocol utilized in a full-scale survey was not generally used. However, in other ways, the field tests used all of the features of the full-scale NHES surveys, including the use of random-digit-dialing (RDD) and computer-assisted telephone interviewing (CATI) methods.

Experienced interviewers were selected to conduct field test interviews, resulting in reduced training requirements. Training for the field tests consisted of interactive lectures and role plays and was conducted using the CATI system, providing the trainees with hands-on experience with the instruments prior to beginning data collection.

In the NHES:91 and NHES:93, which had shorter development periods, field tests were conducted about one month before interviewer training. These field tests served to "shake down" the CATI system and to identify any significant problem areas in the questionnaires. This activity was expanded for the NHES:95 and the NHES:96 to multi-phase, larger field tests conducted in the spring prior to the actual survey. These expanded field-testing activities provided more opportunity to assess the working of the instruments and their administration time, to make the necessary changes in the instruments, and then to test those changes in a live interviewing situation.

In the NHES:95, the two field testing periods were planned, with the first being a relatively large field test to test all paths of the questionnaires and to identify any problems with the instruments. The second phase was a smaller test and focused on the changes made to the instruments after the initial testing period. In order to provide sufficient numbers of cases for rare populations, the RDD sample for the field test was supplemented with cases having desired characteristics. Specifically, persons who participated in adult basic education, GED preparation, or English as a second language programs were added to the sample, so that the working of the instrument for these rare populations could be assessed. Following the first phase of the NHES:95 field test, two smaller phases, rather than one, were conducted to evaluate subsequent changes to the instrument.

The NHES:95 field test experience led to a recommendation to conduct future tests differently; specifically, to conduct a smaller first field test followed by a larger second field test. Because significant difficulties with questionnaires can often be detected quickly with

intensive monitoring of interviews and interviewer feedback, a smaller first field test would permit the resolution of any significant problems prior to the investment of significant resources in the larger field test.

Consistent with the recommendation made at the conclusion of the NHES:95 field test, the NHES:96 field test included a smaller first phase and a larger second phase; a smaller third phase was also added. The first phase of the NHES:96 field test was used to identify any problems in terms of interview flow or the meaning of items to respondents and to assess interview administration time.

Phase two of the field test examined the effectiveness of revisions to the Parent PFI/CI or Youth CI interviews instituted after the first phase. This phase also incorporated two methodological tests of conditions that might affect response rates. The tests were conducted on split-half samples. One split-half test involved mailing an advance information letter to addresses obtained through matching telephone numbers with published addresses. The other test involved administering two versions of the Screener, one containing a question that screened out households with no children age 20 or younger before enumeration and one enumerating every household contacted. Further information on this methodological investigation can be found in *An Experiment in Random-digit-dial Screening* (Brick et al., forthcoming).

The third phase of the NHES:96 field test was conducted for the Adult CI survey. It also incorporated a new placement of the library items in the Screener. Specifically, the third phase of the field test examined placing the library items before the household enumeration matrix to engage the respondent by beginning with substantive questions and therefore improve response rate. Based on the findings from this field test, this new strategy was adopted.

Sampling Procedures

As noted above, the NHES uses a random-digit-dial sampling approach to select households for the surveys. The two approaches used in RDD sampling for the NHES are discussed below in the section on household sampling. Once the sample of telephone numbers was selected, different approaches to enumerating the members of the households and procedures for sampling members within households were used in the surveys. These were largely determined by the specific populations targeted in the substantive components of a given NHES collection. These methods are also discussed below.

Sampling Households

Different methods have been developed over the years for selecting random samples of telephone households. The Mitofsky-Waksberg method of random digit dialing, as described in Waksberg (1978), is the best known and, until recently, one of the most widely used of the methods. This method involves selecting a fixed number of residential telephone numbers in 100-banks (sets of numbers with the same first 8 digits of the 10-digit telephone number). For the NHES:91 and the NHES:93, a modified Mitofsky-Waksberg method described by Brick and Waksberg (1991) was used, in which a fixed number of telephone numbers is sampled from 100-banks. In the NHES:91, 30 telephone numbers were sampled in each of 4,000 100-banks (also known as clusters). In the NHES:93, 27 to 33 telephone

numbers were sampled in each of 4,577 clusters[2]. The specific number of telephone numbers within cluster was determined by the needs of the particular survey and accrued experience with observed residency rates. While the modified method reduced the number of telephone numbers that must be dialed relative to the Mitofsky-Waksberg method, it is still a clustered design and results in an increase in variance of about 10 percent.

A different approach to RDD sampling, called a list-assisted method (Casady and Lepkowski 1993), has become more widely used in recent years, and that method was used for the NHES:95 and the NHES:96. The list-assisted sampling approach is a simple random sample of telephone numbers selected from all telephone numbers that are in 100-banks in which there is at least one telephone number listed in the White Pages (called the listed stratum). Telephone numbers in 100-banks with no listed telephone numbers (called the zero-listed stratum) are not sampled. Telephone numbers in the listed stratum include both numbers listed in the White Pages and unlisted numbers. The design requires only one listed residential telephone number in the 100-bank. This method has several advantages over the modified Mitofsky-Waksberg method. Because it is an unclustered design, the list-assisted approach results in estimates with lower variances than the clustered alternative methods. Brick et al. (1995) discuss the list-assisted method and the Mitofsky-Waksberg method and show the list-assisted method is more efficient. The major disadvantage is that this method incurs a coverage bias because households in the zero-listed stratum have no chance of being included in the sample. However, Brick et al. (1995) demonstrated that the resulting bias is quite small.

[2] Each cluster was composed of a prime number, used to determine whether the cluster was residential, and secondary numbers, a sample of additional telephone numbers in the cluster. In each cluster, 32 secondary numbers were sampled in addition to the prime number, although it was anticipated that 26 secondary numbers would be needed. The additional numbers were sampled in order to provide reserve numbers in case they were needed due to low residency or nonresponse. Early in data collection, all 32 selected secondary numbers were released and worked in some clusters. Only 26 secondary numbers were released and worked in each cluster after the problem of the release of all 32 numbers was identified. The use of different numbers of secondary numbers in the clusters has no effect on the weighting procedures.

Oversampling Households for Blacks and Hispanics

One of the goals of every NHES survey was to produce reliable estimates for subdomains defined by race and ethnicity. In fact, estimates by race and ethnicity were key in developing the sample size for each of the components for each survey year. In a sample of 60,000 households (the NHES household samples ranged from 45,000 to 64,000) in which every person has the same probability of being included, the number of completed interviews with blacks and Hispanics would not be large enough to produce reliable estimates of important characteristics of those subpopulations. Therefore, blacks and Hispanics were sampled at higher rates to improve the reliability of estimates for these groups.

To increase the samples sizes for black and Hispanic persons in the NHES, telephone numbers in areas with high percentages of blacks or Hispanics were sampled at higher rates[3]. The 100-banks were classified in the high minority concentration stratum if at least 20 percent of its population was black or 20 percent was Hispanic. The race/ethnicity distributions were obtained from the most recent census data available. The 100-banks not meeting this requirement were classified in the low minority concentration stratum. The sampling rate in the high minority

[3] In the NHES:93, areas with high percentages of Asians were also sampled at a higher rate to explore the usefulness of this approach. This was not continued in the NHES:95 and NHES:96 for two reasons. First, the procedure was not very effective. Second, the sample frame used for the new list-assisted approach did not have this information available.

concentration stratum was twice the rate of the low minority stratum in all NHES samples.

Oversampling by the characteristics of the prefix area had two effects. First, the oversampling increased the sample sizes for minorities because they were more heavily concentrated in the oversampled 100-banks and, at the same time, reduced the sampling errors for estimates for blacks and Hispanics. On the other hand, not all minorities were found in the oversampled areas so different sampling rates were applied to persons depending on their telephone number. Using differential rates increased the sampling errors of the estimates. These increases partially offset the benefit of the larger minority sample sizes; however, the net result was an increase in precision for estimates for black and Hispanic persons. The technical report *Effectiveness of Oversampling Blacks and Hispanics in the NHES Field Test* (Mohadjer and West 1992) addresses this issue in more detail.

Approaches to Household Enumeration

The approach to screening households also changed over the course of the NHES. These changes include methods of enumerating members of households that are contacted and the amount of information collected in the Screener about the household and its members. The NHES Screeners for the NHES:91, the NHES:93, and the NHES:95 were used to identify households, to collect information needed to sample household members for extended interviews, and to identify the appropriate respondents for interviews about children and youth. The Screeners in these surveys took an average of 2.5 to 3.2 minutes to complete. In the NHES:96, the Screener was also used to obtain household-level characteristics; consequently, it took an average of 7.1 minutes to complete.

Each of the Screeners began by introducing the interviewer, the content of the survey, the fact that the Department of Education sponsored the study, a mention of the voluntary and confidential nature of the study, and a statement that the interview would be brief (5 to 7 minutes). In each year, prompts were added in the Screener to remind respondents to include children living away from home in school housing. In 1995 and 1996, prompts were added to remind respondents to include babies and small children. The Screeners for each year are included with the data files. Some of the key features of the screening methods used in this survey are described below.

- In the NHES:91, a split-enumeration design was used. All households were screened for the ECE component, and a subset of households was screened for the AE component. Under this design, children age 2 to 9 were enumerated in all households with any members in this age range. Then, adults age 16 and older were enumerated in those households selected for the AE portion of the sample. Thus, enumeration of all household members occurred only in those households selected for the AE component in which all household members were either age 2 to 9 or age 16 and older. During enumeration, the first name, age, and the sex of each member were collected.

- In the NHES:93, households were enumerated only when there were any household members age 20 or younger, in which case all household members were enumerated. As in the NHES:91, the enumeration included first name, age, and sex. The purpose of the full enumeration of households with members age 20 or younger was to provide information that would address School Readiness research questions associated with household composition and family relationships.

- In the NHES:95, all households were fully enumerated. The full enumeration of all households was conducted because every household was screened for both the ECPP and AE components and every household potentially had at least one member

eligible for an interview. The NHES:95 also included a test of an Expanded Screener that collected educational and demographic information on the household members and included a brief topical component.

- The Expanded Screener was implemented in the NHES:96. Under the Expanded Screener design, all households were fully enumerated, and information was collected on the demographic and educational characteristics of the household members. As noted above, the Expanded Screener provides a new monitoring capability. In addition, it included a brief topical component in which information was collected on public library use by household members.

Sampling Within Households

The within-household sample designs for the NHES collections were determined by the specific goals of the survey components for each survey year. As noted earlier, some aspects of the within-household sampling protocols were designed to reduce the response burden within households by limiting the number of interviews for which household members were selected. In the sections that follow, the within-household sample design for each NHES collection is briefly discussed.

NHES:91

All 3- to 8-year-olds in sampled households were included in the ECE component of the NHES:91, as were 9-year-olds who had not completed second grade. All children 2 to 9 years old were sampled to ensure that nearly all children eligible for the extended interviews were identified, even if a rounding error was made in reporting the ages of the children. The month and year of the child's birth was collected in the ECE interview and this item was used to separate the eligible and ineligible children for the survey. For eligibility purposes, the child's age was calculated as of December 31, 1990. The parent or guardian of the sampled child reported to be the most knowledgeable about his/her care and education was the respondent for the interview.

It was not necessary to screen all households for AE to achieve the required sample size. Based on the expected rate of participation, it was determined that 31,000 of the 60,0000 should be screened for AE. The probability of screening a household for the AE component was reduced by a factor of two if the household included any children eligible for the ECE component to reduce the response burden. All adults identified as participating in adult education activities in the AE-screened households were sampled, half the full-time degree-seeking students were sampled, and about 7 percent of the nonparticipants were sampled. The sampled adult was the respondent for the AE interview.

After a few weeks of data collection, it was clear that some of the design parameters used in planning the study were not appropriate. Specifically, the rate of participation in AE was substantially greater than was expected based on the 1984 CPS adult education supplement. Based on these early results, two changes were made in the sampling procedures for the AE component. The number of sampled households screened for AE component was reduced; altogether, 18,463 households out of 60,300 completed Screeners (31 percent) were screened for the AE component. In addition, the sampling rate for nonparticipants was increased from 7 percent to 12 percent.

The NHES:91 inference population was the noninstitutionalized, civilian population. When the industry and occupation codes (SIC and SOC) of AE respondents were examined, the sample was found to include some members of the armed services who were living in their own homes outside of military living quarters. These adults were included in the data file but assigned weights of zero, since they were not included in the population of interest.

NHES:93

Unlike the NHES:91, in which each eligible child was selected, subsampling of children within households was implemented in the NHES:93. This was necessary because both NHES:93 components focused on children and the potential response burden could have been quite large if all children from age 3 through 12th grade were sampled.

The interviews for the SR component were conducted with the most knowledgeable parents/guardians[4] of children age 3 through 7 and children age 8 or 9 who had not completed second grade. If there were one or two eligible children in a household all the children were sampled. If there were more than two eligible children in the household, two were randomly sampled from the household.

Any child enrolled in grades 3 through 12 and below the age of 21 was eligible for sampling for the SS&D component parent interview. A parent was asked to complete the extended interview for every sampled child. The probabilities of selecting 3rd through 5th graders were lower than the probabilities of selecting those in the upper grades. In an effort to reduce the burden on the sampled households, the sampling was limited so that, at most, one child in 3rd through 5th grades and no more than two children in any household were sampled for SS&D parent interviews. As a result, a maximum of two children per household were selected for the SS&D component; the maximum could consist of one 3rd through 5th grader and one 6th through 12th grader or two 6th through 12th graders.

At the next sampling stage, youth themselves were subsampled and interviewed after the parent interview was completed. The sample was restricted so that no more than one youth was subsampled per household for the youth interview. Thus, if two 6th through 12th graders were sampled for the parent interview, then one of the two youths was randomly sampled for the youth interview. The youth interview was not conducted until the parent interview was completed.

If a child was enrolled in 6th through 12th grade but did not live with a parent or guardian, that youth was considered an emancipated youth. A special emancipated youth interview was conducted that included some questions that were usually asked only of parents. For this reason, the emancipated youth interviews may be considered with the parent interviews for some analyses. The responses of the emancipated youth are included in the SS&D data file.

NHES:95

The interviews for the ECPP component were conducted with the most knowledgeable parents/guardians of sampled children aged 0 to 10 years who were in third grade or below. The within-household sample size was limited to two eligible children to limit the amount of time required to interview parents in households with a large number of eligible children. In households with one or two eligible children, all the eligible children were sampled. If there were more than two eligible children in the household, two were sampled. In these households, children in kindergarten were sampled at 1.5 times the rate for other children to improve the precision of single-year estimates for kindergartners.

Any adult aged 16 years or older not currently enrolled in secondary school was eligible for sampling for the AE component. Sampled adults who said they were on active duty in the U.S. Armed Forces were classified as ineligible for the interview. Unlike the NHES:91, all households were screened for AE in the NHES:95. This was

[4] In the NHES:93, a slightly different approach was used to identify parent respondents. If the Screener respondent was clearly the child's mother, she was asked to complete the interview. If the Screener respondent was not the child's mother (or this was unknown), the respondent was asked to identify the most knowledgeable parent. If it was reported that both parents were equally knowledgeable, the mother was requested. This practice was not continued in subsequent years because of interviewer reports of objections from fathers who were Screener respondents.

necessary because adults without a high school diploma or its equivalent, especially those who were AE participants, were of great interest. This population is relatively rare, so all households had to be screened for AE to achieve the desired sample sizes.

In the screening interview, each adult was classified as being in one of four sampling categories: 1) low education, participated in adult education (LP); 2) low education, did not participate in adult education (LU); 3) high education, participated in adult education (HP); and 4) high education, did not participate in adult education (HU). After the adults were classified, an unequal probability sample of adults was selected; probabilities of selection were lowest for HUs and highest, near certainty, for LPs. The sampled adult was the respondent for the interview.

Some adults who were classified as participants in adult education in the Screener reported in extended interviews that they were not participants and vice versa. This was anticipated based on the NHES:91 findings and was taken into account in the sample design. The misclassification of persons in the screening interview for sampling purposes did not bias the estimates of participation, because these estimates are based on the responses of the sampled adult rather than another household member.

NHES:96

The samples of persons were selected separately for the Parent PFI/CI and Youth CI interviews and the Adult CI interviews. Specifically, 95 percent of the household sample was designated for sampling children and youth for the Parent PFI/CI and Youth CI interviews. The remaining 5 percent of the sample was allocated to Adult CI interviewing.

In the NHES:96, the Parent PFI/CI interview was conducted with the most knowledgeable parents or guardians of a sample of children from age 3 through 12th grade, with a maximum age of 20. In households with one or more children from age 3 through 5th grade (younger children), one child in the household was sampled for the survey. In households with one or more children in 6th through 12th grade (older children), one child was sampled. Thus, the within-household sample size was limited to two eligible children, and two children were sampled only when both younger and older children were in the household. This design limited the amount of time required for the survey for parents in households with a large number of eligible children. Unlike the NHES:93, emancipated youth (those who did not live with a parent or guardian) were not sampled for interviews because of the focus on parental involvement in the NHES:96.

One youth was sampled for the Youth CI component in households with one or more youth in grades 6 through 12. The interviews with youth were conducted only for those youth in grades 6 through 12 with completed Parent PFI/CI interviews. This allowed the parent the opportunity to give an informed consent for the interviewing of their child (the issues covered in the Youth CI interview were included in the Parent PFI/CI interview). All youth in grades 6 through 12 whose parents completed an interview were selected for the Youth CI interview. Because households may have had up to two Parent PFI/CI interviews and up to one Youth CI interview, the maximum number of interviews per household was three.

In the 5 percent of the household sample set aside for the Adult CI component, exactly one adult age 18 and older not in elementary or secondary school and not on active duty in the Armed Forces was sampled for an Adult CI interview. No other interviews were conducted in these households. The sampled adult responded to the interview.

Data Collection

This section discusses the data collection approaches used in the NHES. Data collection for each NHES survey took place over a 3 to 4 month period beginning in January of each survey year. Training of the data collection staff preceded each survey. In the sections that follow, the training and calling protocols are briefly presented.

Interviewer Training

The data collection process began with the training of telephone interviewers and supervisors. Intensive interview training has been a feature of the NHES from its inception and is considered a critical quality-control activity. The amount of time spent on interviewer training for the NHES varied from 16 to 20 hours, depending on the needs of the particular components. Interviewer training was conducted over a period of about 3 weeks just prior to and following the start of each data collection. More than 300 interviewers were trained for each cycle of the study, in groups of about 35. Each group received training related to the conduct of the NHES following basic training in general interviewing techniques and the use of the CATI system. Training was followed by a scheduled 4-hour "live" session that was closely monitored by training staff and telephone interviewing supervisors.

Interviewer training for the NHES was conducted using the CATI system. In this way, the trainees actually entered information in the CATI system during training presentations, providing them with hands-on experience prior to beginning data collection. The training sessions included an introduction to the study and the specific components for that survey year. The majority of training time was spent on interactive lectures and practice interviews using role-play scripts which gave the interviewers experience with each of the survey questionnaires. Considerable time was also devoted to procedures for contacting households and respondents and methods for avoiding refusals.

Interviewers were monitored extensively during the role-play sessions, and during their early sessions of live interviewing. Retraining was given as warranted, and any interviewer who did not meet the interviewing standards was released from the study. Additional refusal avoidance training was given to interviewers in the first week of interviewing, after they had gained some experience. Supervisors, project staff, and other telephone research staff monitored interviewers throughout the data collection period. After approximately 2 weeks of data collection, interviewers identified as having demonstrated or potential skill in converting or avoiding refusals were trained for refusal conversion (calling households that did not cooperate in the initial contact and asking them to agree to participate).

The survey staff included interviewers able to speak English and Spanish. These interviewers received the same English training as all other interviewers and were then trained to conduct the interviews in Spanish. All of the CATI screens were translated into Spanish, and these screens were available to bilingual interviewers at a keystroke.

Calling Protocol

A detailed calling protocol guided the data collection process. The process began by requiring at least seven attempts to contact a household and complete a screening interview. These calls were staggered on different days of the week and at different times of the day over a period of at least 2 weeks, including at least two daytime calls, three evening calls, and two weekend calls. Often, contact at a telephone number was made on the first or second attempt, and the case was finalized as a completed interview or as a nonworking or nonresidential telephone number. After about half the data collection period was completed, those telephone numbers that had not resulted in a contact after

seven calls were refielded for up to 7 more calls. As a result, most numbers not reached were dialed at least 14 times by the end of the study in an attempt to contact the household.

The NHES Screeners were completed with an adult household member. If no household members were sampled for extended interviews, then the case was complete. If there were any extended interviews to be completed, interviewers attempted to conduct those interviews immediately. If any respondent was not available, a callback appointment was made. Repeated callbacks were made throughout the data collection period in order to complete the interviews.

For the NHES:96, two procedures were used to eliminate some of the nonworking and nonresidential numbers prior to data collection. These procedures were:

- **Business purge** - all telephone numbers were matched against residential White Pages listings and Yellow Pages business listings. Numbers that appeared only in the Yellow Pages business listings were classified as nonresidential and were not dialed. Numbers appearing in both listings were dialed.

- **Tritone test** - the telephone numbers were automatically dialed by computer; those that received tritone signals (the three-bell sound heard when a nonworking number is reached) on two separate calls on different days were classified as nonworking. These numbers were not dialed thereafter.

In addition to these procedures, special efforts were undertaken to increase the Screener response rates in 1995 and 1996. In 1995, the telephone numbers of nonrespondents with about one month left in the data collection period were sent to a commercial firm to obtain a mailing address. For those telephone numbers for which an address could be obtained, a letter was mailed explaining the study and asking the household to cooperate. A similar procedure was used in 1996 except all telephone numbers were put through the process prior to data collection, and a letter was sent in advance of any telephone contact.

Another procedure that was used in an attempt to improve response rates for the NHES:95 and the NHES:96 was the handling of answering machines. If an answering machine was encountered, the interviewer left a message stating the importance of the study and the fact that interviewers would attempt to call the household later. The message was left the first time an answering machine was reached at a number and then again near the end of data collection.

Special procedures were used to handle cases in which a language problem or refusal was encountered in every survey. These are described below.

Language problems. If the person answering the telephone was not able to speak English, and the interviewer was not bilingual and was not able to identify an English-speaking household member, the interviewer coded the case a "language problem" and further specified the case as either "hearing/speech problem," "Spanish," or "language other than English or Spanish." Cases coded as language problems were placed in a special work queue and bilingual interviewers were assigned to work these cases. If a bilingual interviewer encountered a Spanish-speaking respondent on an initial call, the interviewer immediately conducted the interview in Spanish. Because the CATI system contained both English and Spanish versions of the instruments, bilingual interviewers were able to rapidly convert their screens from English to Spanish (and vice versa). Cases coded as hearing/speech problems were called a second time. If an interviewer was able to reach a household member who could complete the interview, the case was completed; if no household member was able to complete the interview, the case was finalized as a language problem.

Refusals. If the person refused the interview, the case was classified as a refusal and placed in a separate work queue for later assignment to an interviewer trained in refusal conversion. Refusal conversion was attempted in nearly all households in which someone had initially refused to complete an interview. If the interviewer indicated that the initial refusal was "hostile" (e.g., profane or abusive), the case was reviewed by a supervisor to determine whether another attempt should be made. At least one refusal conversion attempt was made for each Screener or extended interview refusal, with the exception of the "hostile" cases. For most of the field period, conversion attempts were not made until at least 13 days after the initial refusal.

A case was coded as a final refusal if a second refusal was obtained when a refusal conversion attempt was made. However, because of the desire to increase the Screener response rate, an additional refusal conversion attempt was made for a subset of second refusals, provided neither the first nor second refusal was hostile. All Screener refusals were considered to be final if a third contact with the household resulted in a refusal. For extended interviews, cases were coded as final refusals if the first conversion attempt resulted in another refusal.

Response Rates

A response rate is the ratio of the number of units with completed interviews (the units could be telephone numbers, households, or persons) to the number of units sampled and eligible to complete the interview. In some cases, these rates are easily defined and implemented, while in other cases the numerators or denominators of the ratio must be estimated.

Two types of response rates are presented for the NHES. One is the completion rate, which measures completed interviews for a specific stage of the survey data collection. The other is the response rate, which is the percentage of interviews completed, taking all survey stages into account. For example, household members are identified for extended interviews in a two-stage process: first, Screener interviews are conducted to enumerate and sample household members, and second, interviews are conducted for the sampled members using extended questionnaires. The failure to complete the first stage Screener means that it is not possible to enumerate and interview members of the household. The completion rate for the second stage is the percentage of sampled and eligible persons with completed interviews. The response rate is the product of the first- and second-stage completion rates. All of the rates are weighted by the inverse of the probability of selecting the units. Table 3 summarizes the completion and response rates for each component of each year of the NHES.

Two features of response rates are apparent when reviewing table 3. First, there are substantial differences in Screener completion rates for the surveys. The Screener completion rates were higher for the NHES:91 and NHES:93 than for the NHES:95 and NHES:96. Second, while completion rates for parents of sampled children were consistently 89 percent or higher, response rates for other extended interviews with adults and youth were lower.

As noted previously, the screening approach used in the NHES varied from one survey year to another. In the NHES:91, a split-enumeration design was used in which some households were screened out as ineligible and others were partially enumerated. In the NHES:93, households without members age 20 or younger were screened out prior to enumeration. The NHES:95 and the NHES:96 designs included full enumeration of all household members at the Screener. The screening response rate for these two later surveys were markedly lower than the rates for the early collections. The screening completion rate for the NHES:91 and the NHES:93 were 81 percent and 82 percent, respectively. In the NHES:95 and NHES:96, the screening completion rate dropped to 73 percent and 70 percent, respectively. An experiment

conducted in the course of the NHES:96 field test examined differences in response rates under conditions of full enumeration of all households and enumeration of only those households with members age 20 or younger. The results of that research indicate that a substantial response differential may result from the these different approaches. (See *An Experiment in Randon-digit-dial Screening*, Brick et al., forthcoming, and *An Overview of Response Rates in the National Household Education Survey: 1991, 1993, 1995 and 1996*, Brick et al., forthcoming.)

Table 3.—Weighted NHES completion and response rates, by survey year and component

Interview type	Completion rate	Response rate
NHES:91		
Screener	81.0	81.0
Early Childhood Education interview	94.5	76.5
Adult Education interview	84.7	68.6
NHES:93		
Screener	82.1	82.1
School Readiness Interview	89.6	73.6
School Safety & Discipline interview		
Parents of 3rd through 5th graders	89.4	73.4
Parents of 6th through 12th graders	89.6	73.6
6th through 12th graders	83.0	68.1
NHES:95		
Screener	73.3	73.3
Early Childhood Program Participation interview	90.4	66.3
Adult Education interview	80.0	58.6
NHES:96		
Screener/Household & Library	69.9	69.9
Parent/Family Involvement in Education and Civic Involvement Parent interview	89.4	62.5
Youth Civic Involvement interview	76.4	53.4
Adult Civic Involvement interview	84.1	58.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Survey (NHES).

Adults selected for the AE components in 1991 and 1995 had completion rates of 85 percent and 80 percent, respectively. Adults sampled for the NHES:96 Adult CI component had a completion rate of 84 percent. Completion rates among youth in the NHES:93 and the NHES:96 were 83 percent and 76 percent, respectively. Youth interviews were not attempted until a parent interview about the sampled youth had been completed. Therefore, there was a loss in response associated with both the parent level and the youth level, which largely accounts for the lower response rates for youth. In the NHES:93, the interviewer asked the parent if the youth could be interviewed for the study, but did not explicitly ask for permission to conduct the interview. This procedure was revised in the NHES:96 and explicit permission was requested. The change in procedure might be responsible, at least in part, for the lower completion rate for youth in the NHES:96. It is also possible that the relative salience or sensitivity of the topics (school safety and discipline and civic involvement), as perceived by the respondents, affected parent consent and youth participation.

Data Editing

Intensive data editing was a feature of both the data collection and file preparation phases of the NHES collections. Range checks for allowable values and logic checks for consistency between items were included in the online CATI interview so that many unlikely values or inconsistent responses were resolved while the interviewer was speaking with the respondent. The CATI system included an online "comments notebook" in which interviewers could provide explanations of unusual responses, for example, stating that a respondent had confirmed that an out-of-range value was correct.

Post-interview editing was conducted throughout data collection, after data collection was completed and prior to imputation, and after imputation was completed. In addition to range and logic edits, the post-interview edits included checks for the structural integrity of the hierarchical CATI data base and data integrity edits for complex skip patterns. The post-interview editing process also included a review of comments provided by interviewers and problem sheets completed by interviewers.

Following the resolution of any problems identified in post-interview editing process, data preparation staff reviewed frequency distributions and cross-tabulations of the data sets in order check skip patterns and to identify any skip pattern errors that might have been introduced during data updates. . Editing was repeated following the completion of imputation.

Coding Open-Ended Items

Open-ended items were coded for the NHES:91 and NHES:95 AE components. These items included AE courses, major fields of study for college and vocational programs (NHES:95 only), industry, and occupation. Selected relevant variables were provided to coders. For example, course name, subject matter, major field of study, provider type, course length, and other courses taken were provided for coding AE courses. Job title, job duties, employer name, industry, and highest education were provided for coding industry and occupation. In all cases, a double-blind coding procedure was used, in which two coders independently assigned a code. In cases for which these two codes were discrepant, an "adjudication" coder was responsible for reviewing the case and assigning an appropriate final code. Following the completion of coding, a senior coding supervisor reviewed a systematic random sample of the discrepancy cases and all cases assigned a code of "other" or "unclassifiable."

A number of items in each NHES survey included categories of "other, specify," in which interviewers entered responses that could not be classified in one of the precoded categories. Some examples of such variables include race, job-seeking activities by parents and adults,

barriers to participation in adult education, and reasons for home schooling a child. These open-ended text responses were reviewed by data preparation staff and survey managers to determine whether any answers should be reclassified into existing response categories. In some cases, additional response categories or variables were constructed for frequently occurring responses. Two examples of items for which multiple additional categories were created are barriers to participation in adult education and reasons for home schooling.

Imputation

In the NHES, as in most surveys, the responses to some data items were not obtained for all interviews, resulting in item nonresponse. There are numerous reasons for item nonresponse: some respondents may not know the answer or may not wish to respond for other reasons; an interview is interrupted and not continued later, leaving items at the end of the interview blank; and responses provided by the respondent may not be internally consistent and the inconsistent items are set to missing.

For most of the data items collected in the NHES, the item nonresponse rate was very low. Despite the lów item nonresponse rates, some data items with missing data were imputed for the NHES:91, while for the NHES:93, the NHES:95 and the NHES:96, all data items other than text items (e.g., "other, specify" responses) with missing data were imputed. The imputations were done for two reasons. First, certain variables were used in developing the weights and complete responses were needed for this purpose. These included the variables used for raking and other variables, such as the number of residential phones. Second, users were expected to compute estimates using a variety of methods and complete responses should aid their analysis.

A hot-deck procedure was used to impute missing responses. In this approach, the entire file was sorted into cells defined by characteristics of the respondents. The variables used in the sorting were general descriptors of the interview and also included any variables involved in the skip patterns for the items. All of the observations were sorted into cells defined by the responses to the sort variables, and then divided into two classes within the cell depending on whether or not the item being imputed was missing. For an observation with a missing value, a value from a randomly selected donor (observation in the same cell but with the item completed) was imputed for the missing value. After the imputation was completed, edit programs were run to ensure the imputed responses did not violate edit rules.

For some items, the missing values were imputed manually rather than using the hot-deck procedure. This happened most often when the variable was collected only once for the household or involved complex relationships. Manual imputation was also used if a small number of edit failures were found after the hot-deck imputations were completed.

For each data item for which any values were imputed, an imputation flag variable was created. The imputation flags were created to enable users to identify imputed values. Users can employ the imputation flag to delete the imputed values, use alternative imputation procedures, or account for the imputation in computation of the reliability of the estimates produced from the data set. In some survey components, the "don't know" responses for some questions may have a different substantive meaning than other nonresponse. These questions were still imputed, but the imputation flags were set to a different value to inform users of the original "don't know" response. The values of the imputation flags used for this purpose in the NHES:93 are different than those used for the same purposes in the NHES:95 and the NHES:96.

Weighting Procedures

The objective of the NHES is to produce estimates that can be used to make inferences

about the entire civilian, noninstitutionalized population of the United States and for subgroups of the population. Although only telephone households were sampled, the weights of the respondents were adjusted to totals of both the telephone and nontelephone population derived from appropriate reports from the Current Population Survey (CPS). As a result, any undercoverage in the CPS for special populations, such as the homeless, are also reflected in the NHES estimates. The potential for bias due to sampling only telephone households has been examined for virtually all the population groups sampled in the NHES. Generally, the bias in the estimates due to excluding nontelephone households is small. Coverage bias is discussed more later in the section on data quality.

The procedures used to develop the weights for the surveys are very similar. As a result, the general procedures are outlined below and any major deviations from these methods for a particular survey year or component are mentioned. The description is divided into two stages corresponding to the stages of weighting; first is the household level weighting and second is the person level weighting.

Household Weights

The first stage of weighting in all the NHES surveys was associated with the probability of sampling of telephone numbers or households. The household level weight took into account all of the factors that might have resulted in adjustments due to the telephone numbers being sampled at different rates. Two of these factors that were common to all the years were the adjustment to account for the differential sampling rates by minority concentration and the adjustment to account for households that have more than one telephone number and, hence, chance of being sampled.

In 1991 and 1993, an adjustment was also made to account for the modified Mitofsky-Waksberg method of RDD sampling. This adjustment was no longer needed in 1995 and 1996 because the list-assisted sampling approach was used. The NHES:96 included an adjustment for the oversampling in 18 states to bring the minimum expected number of completed Screeners up to 500.

As noted in the previous section, the Screener response rates for the NHES:95 and the NHES:96 were lower than previous years. Analyses were conducted to determine correlates of the response rate using data available about telephone exchanges. For the NHES:95, the variables correlated with the response rate were then used to define nonresponse adjustment classes, and the inverse of the response rate in a class was used as the weight adjustment. The nonresponse adjustment classes were based on the following variables: metropolitan status, census division, percent renters, percent owner occupied, percent college graduates, median income, percent black, percent Hispanic, and percent age 0 to 17. The nonresponse adjusted weights were subsequently used in all other stages of weighting in the NHES:95 to attempt to reduce the bias from nonresponse.

For the first time in the NHES:96, household weights were needed to produce estimates from the Household & Library data file. To ensure that these estimates conformed to national totals, to reduce the bias associated with sampling only telephone households, and to adjust for nonresponse bias, the NHES:96 household weights were adjusted to known national totals of households using an iterative procedure called raking. As a result of raking, the household estimates match control totals of the number of households formed using the following variables: state, presence of children in the household, whether the home was owned or rented, urban or rural location, and race. These variables encompassed all variables identified as important in the analysis done to identify correlates of nonresponse. The control totals were the March 1995 CPS total household

estimate distributed according to the 1990 decennial Census of Population household distributions. The final household weights are included in the Household & Libraries data file.

Person Weights

The next stage of weighting was to form weights for each extended interview in the NHES. These are called person weights. For example, in the NHES:91 person weights were developed for each sampled child in the ECE component even if the same parent responded to both interviews. Thus, the estimates from the NHES:91 ECE component correspond to the population of children eligible for the survey. Person weights were also prepared for each AE interview in the NHES:91 and for every other survey component for the other years.

The first step in creating the person weights was to assign the appropriate household weight to the sampled person as a base weight that could then be modified to account for other stages of sampling, nonresponse, and adjustments to known population control totals. The first modification to the base weight was to account for the within-household sampling of persons. In some cases, like the ECE component of the NHES:91, all eligible persons were sampled and the factor was equal to unity. In other cases the probability of sampling the person within the household was much more complex. For example, in the NHES:95 AE component the probability of sampling an adult from the household was a function of participation status and education level and also depended on the number and characteristics of the other adults in the household. The appropriate factor was developed for each component and survey year and multiplied by the base weight to produce an initial person weight for each completed interview.

These person weights were then adjusted to account for nonresponse. This step was not necessary for the NHES:91 ECE and the NHES:95 ECPP surveys because the completion rates were so high for all the sampled children in these surveys. In most of the surveys, some characteristics about the sampled person such as age, sex, grade in school, adult education participation status, or education level were collected in the Screener and used to form nonresponse adjustment classes. The nonresponse adjustment for respondents within a class was the inverse of the within-class completion rate for the extended interviews. In some components, the nonresponse adjustments were relatively constant over the classes because the completion rates did not vary much from one class to the next while in other components these adjustments varied substantially. For example, in the NHES:93 School Readiness component, the nonresponse adjustment classes were six age categories and the adjustments varied across the classes from 1.09 to 1.14. On the other hand, the adjustment classes for the 1995 AE component were defined by the adult's participation status in adult education and by whether or not they had completed high school. These nonresponse adjustments varied by a factor of more than 1.5 across the classes.

The last step was to rake the nonresponse adjusted person weights so that the estimates from the surveys matched appropriate control totals for the population being surveyed. The raking procedure for the person weights was identical to that described above for the final household weights in the NHES:96. The only differences are that the nonresponse-adjusted person weights were the weights being adjusted (rather than the household weights) and the control totals were counts of persons (rather than ouseholds). The source of the control totals of the number of persons was the CPS for the month corresponding most closely to the NHES survey for which comparable estimates could be produced. Although the variables used to form the control totals varied from year to year and component to component, they were very similar because the main purpose of the

raking was always to reduce the bias in the estimates arising from the failure to sample nontelephone households. Typically, the control totals involved some combination of the following variables: whether the home was owned or rented, race/ethnicity, household income, Census region, urban or rural location, and age or grade. The final person weights included in the public release data files were the raked person weights.

Variance Estimation Methods

The sampling and estimation techniques described above have consequences for the analytic methods that should be applied in making estimates from the NHES data. One of the most important features is that the weights should always be used when making estimates of the population. These weights are important not only for estimates of totals, but also for estimates of means and proportions.

The sampling and estimation procedures also have an important impact on the estimates of the reliability of the estimates from the NHES. The standard errors of the estimates are affected by these procedures. If the standard errors are computed using standard statistical software such as SAS or SPSS, they will underestimate the actual standard errors for most estimates because these software packages assume the data are from simple random samples. In fact, the data are the product of very complex procedures that may differ substantially from a sample random sample.

The two major methods of producing approximate standard errors for complex samples are replication methods and Taylor series approximations. Special software is available for both methods, and the NHES data support either type of analysis. A brief description of the software and methods of using it for the NHES data file follows.

The replication method involves splitting the entire sample into a set of groups, or replicates, based on the actual sample design of the survey. The survey estimates can then be estimated for each of the replicates by creating replicate weights that mimic the actual sample design and estimation procedures used in the full sample. The variation in the estimates computed from the replicate weights can then be used to estimate the sampling errors of the estimates from the full sample. Replicate weights have been included in all the NHES data files to make this application relatively simple.

WesVarPC is software developed for personal computers under Windows that produces estimates and their standard errors using replication methods. The replication method is especially useful for the NHES because this is the only method that accounts for both nonresponse adjustments and the raking adjustments to the population control totals in the estimation of the standard errors. WesVarPC currently supports a wide variety of estimates (totals, means, proportions, ratios, and user-defined functions of estimates) as well as procedures for estimating linear and logistic regression coefficients. WesVarPC can read SAS (version 604), SAS Transport, and SPSS for Windows, dBase, and ASCII files.

The WesVarPC software and documentation is available free of charge through the Internet (http://www.westat.com) or by sending an e-mail message to wesvar@westat.com. Those without access to the Internet but interested in obtaining a copy of WesVarPC may also write to: Maida Montes, Westat, Inc., 1650 Research Boulevard, Rockville, MD 20850.

The Taylor series approach can also be used for the NHES. The two most commonly used software packages for this approach are SUDAAN and PCCARP. Both of these programs are for personal computers and can be used to compute estimates of totals, means, and proportions as well as linear and logistic regression coefficients. Neither can account for nonresponse or raking adjustments to the weights,

but for many estimates these adjustments are not critical for estimating the standard errors.

SUDAAN is available through the Research Triangle Institute. Information on obtaining the software, including cost information, can be obtained by writing to Dr. Babu Shah, Research Triangle Institute, P.O. Box 12194, Research Triangle Park, NC 27709. Information on PCCARP, including costs, can be obtained by writing to Dr. Wayne Fuller, Department of Statistics, Iowa State University, Ames, IA 50010.

An approach that is frequently used for complex analysis such as regression is to use the standard statistical software for exploratory data analysis and model fitting. Once the model is formulated, the appropriate analysis using WesVarPC or SUDAAN is used to estimate the parameters and the standard errors. This method is frequently used by analysts who are very familiar with a particular software package and feel more comfortable with using it during the exploratory stage. This is often a reasonable compromise, since the final estimates are produced using the appropriate software.

Further information on the use of replication and Taylor series methods is provided in the general guide to using NHES data (Collins and Chandler, forthcoming.)

Data Quality Assessment Activities

In addition to the data quality activities inherent in the NHES design and survey procedures, activities specifically designed to assess the quality of data were undertaken for each collection. Two data quality activities included in every year are a reinterview program and an analysis of telephone coverage bias. Other data quality activities were included to address specific concerns, such as the response bias study for the AE component of the NHES:95 (Brick et al. 1996). However, only the reinterview program and the telephone coverage bias activities are described below.

Reinterview Program

One of the methods used to examine the reliability of the responses to interviews is the NHES reinterview program. Reinterviews have been conducted for the Early Childhood component of the NHES:91, both the School Readiness and School Safety and Discipline components of the NHES:93, the Adult Education component of the NHES:95, and for the Parent and Family Involvement and Civic Involvement components of the NHES:96.

The reliability of the responses to the interviews were estimated by reinterviewing a sample of respondents and asking them a subset of the same items included in the original interview. The reinterview procedure did not account for all the measurement errors in the interviewing process. For example, systematic errors that would be made in both the original interview and the reinterview were not discovered with this approach. Rather, the statistics produced by comparing the original and reinterview responses estimated the consistency of reporting, assuming both interviews were conducted under the same general conditions.

A general review of the design and analysis of reinterviews presented by Forsman and Schreiner (1991) is useful background for understanding the goals and methods used in the NHES reinterview program. Brick et al. (1994) discuss the use of reinterview data in the broader context of other nonsampling errors. The goals of the NHES reinterview program were as follows:

- To identify survey items that were not reliable, i.e., the two interviews did not elicit the same response;
- To quantify the magnitude of the response variance for groups of items collected from the same respondent at two different times; and
- To provide feedback to improve the design of questionnaire items for future surveys.

In the NHES reinterviews, the same respondents were asked to respond to the same items on different occasions. In order to limit the response burden of the reinterview program, only selected items were included in the reinterviews. The item selection criteria focused on the inclusion of key survey statistics (for example, frequency of reading to children), items that were expected to have a potential for measurement error based on cognitive laboratory or field test findings, and items required to control the question skip patterns for the reinterview. The results of the reinterviews were used to modify later NHES surveys and to give some guidance to users about the reliability of responses for specific items in the data files (Nolin and Chandler 1997).

Coverage Bias

Another data quality activity in the NHES is research concerning the bias resulting from excluding nontelephone households from the survey. Bias is the expected difference between the estimates from the survey and the actual population value. For example, if all telephone households were included in the survey and responded to the required interviews, the difference between the estimate from the survey and the actual population value (which includes the responses of persons living in nontelephone households) is the bias due to incomplete coverage. Since the NHES is based on a sample, the bias is defined as the expected or average value of this difference over all possible samples.

Every household survey is subject to some undercoverage bias, the result of some members of the target population being either deliberately or inadvertently missed in the survey. Telephone surveys like the NHES are subject to an additional source of bias because only about 93 percent of all the households in the United States have a telephone. Even more problematic is the fact that the percentage of households without telephones varies from one subgroup of the population to another.

Because of uncertainty on how the variability in telephone coverage affects statistics gathered in the NHES, special analysis of the bias associated with telephone coverage and its potential impact on estimates from the NHES was conducted for each cycle of the survey system. For each assessment of coverage bias, data from the CPS were used to evaluate the differences between estimates for telephone households and estimates for the entire population.

Two types of comparisons were made using the CPS data. First, estimates for telephone and nontelephone households were compared in order to examine the extent of the disparity between these two groups of households on key statistics of interest. Second, weights for telephone households from the CPS were adjusted using the raking procedures used in the development of weights for NHES interviews. The adjusted estimates from the CPS telephone households were compared to estimates from all households, including those with and without telephones.

The coverage research showed that, for most estimates, the bias due to not sampling nontelephone households is small, but there are important exceptions. For subgroups with characteristics that are highly correlated with not having a telephone, such as the poor, the coverage bias can be large. An important example of this problem is estimates of high school dropouts. No adjustments could be found to adequately reduce the amount of bias in these estimates despite significant research into this topic.

NHES Data Sets

NHES data are made available to the public. Each data set includes administrative variables; characteristics of respondents and, in many cases, other household members; questionnaire variables; derived variables formed by combining other variables; weights; replicate weights; and imputation flags. In order to protect the

confidentiality of NHES respondents, any identifying information or variables that could, in combination, lead to the identification of individual respondents are removed from the data files prior to their release.

The public-use data sets are distributed on CD-ROM. The NHES CD-ROM also contains the Data File User's Manuals for each data set, a user's manual for the Electronic CodeBook, and a general guide to using NHES data. Data sets are accessed through the menu-driven Electronic CodeBook (ECB).

Using this program, analysts can view question wording and frequency distributions, "tag" variables of interest, subset the population using selected variables (e.g., age, race/ethnicity, sex, and enrollment status), and output the SAS, SPSS for DOS, or SPSS for Windows syntax code needed to create an analysis file.

Restricted-use data sets are also available under a special licensing agreement with NCES. The restricted-use files contain detailed information that does not appear on the public-use data sets. Text items provided on these data files include "other, specify" responses, names of courses taken, text items describing employment that were used to code industry and occupation, and so on. For the NHES:93 through NHES:96, the restricted use data sets also contain a large number of variables describing the demographic characteristics of the area in which the sampled household is located. These variables were extracted from the 1990 Census of Population Summary Tape File 3B by matching the respondent's ZIP code to the Census information. Persons interested in obtaining the restricted data sets for the NHES should contact Cynthia Barton of the NCES Statistical Standards and Services Group at Cynthia_Barton@ed.gov or at (202) 219-2199.

NHES Publications

A complete list of NHES data products, publications, and working papers can be found at www.ed.gov/NCES/NHES or can be obtained by calling Kathryn Chandler of NCES at (202) 219-1767.

References

Brick, J.M., Cahalan, M., Gray, L., Severynse, J., and Stowe, P. (1994). *A Study of Selected Sampling Errors in the 1991 Survey of Research College Graduates*. Technical Report. NCES 95-640. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Brick, J.M., Collins, M.A., and Chandler, K.A. (forthcoming). *An Experiment in Random-Digit-Dial Screening*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Brick, J.M., Collins, M.A., and Chandler, K.A. (forthcoming). *An Overview of Response Rates in the National Household Education Survey: 1991, 1993, 1995 and 1996*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Brick, J.M., Kim, K., Nolin, M.J., and Collins, M.A. (1996). *Estimation of Response Bias in the NHES:95 Adult Education Survey*. NCES Working Paper 96-13. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Brick, J.M. and Waksberg, J. (1991). Avoiding sequential sampling with random digit dialing. *Survey Methodology*. 17(1): 27-42.

Brick, J.M., Waksberg, J., Kulp, D., and Starer, A. (1995). Bias in list-assisted telephone samples. *Public Opinion Quarterly*. 59(2): 218-235.

Casady, R.J. and Lepkowski, J.M. (1993). Stratified telephone survey designs. *Survey Methodology*. 19(1): 103-113.

Collins, M.A., and Chandler, K. (forthcoming). *A Guide to Using Data from the National Household Education Survey (NHES)*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Forsman, G. and Schreiner, I. (1991). The design and analysis of reinterviews: An overview. In Biemer, P., Groves, R., Lyberg, L., Mathiowetz,, N., and Sudman, S. (eds.) *Measurement Error in Surveys*. 279-302. New York: John Wiley & Sons.

Hill, S. (1987). *Trends in Adult Education: 1969-1984*. Washington, DC: U.S. Department of Education, Center for Education Statistics.

Morgan, R.L., Hunt, E.S., and Carpenter, J.M. (1990). *Classification of Instructional Programs*. NCES 91-396. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

Mohadjer, L., and West, J. (1992). *Effectiveness of Oversampling Blacks and Hispanics in the NHES Field Test*. NCES 92-104. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Nolin, M.J., and Chandler, K.A. (1996). *Use of Cognitive Laboratories and Recorded Interviews in the National Household Education Survey*. NCES 96-332. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Standard Industrial Classification Manual. (1987). Washington, DC: Executive Office of the President, Office of Management and Budget.

Standard Occupation Classification Manual. (1980). Washington, DC: U.S. Department of Commerce, Office of Federal Statistical Policy and Standards.

Waksberg, J. (1978). Sampling methods for random digit dialing. *Journal of the American Statistical Association*. 73(361): 40-46.

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